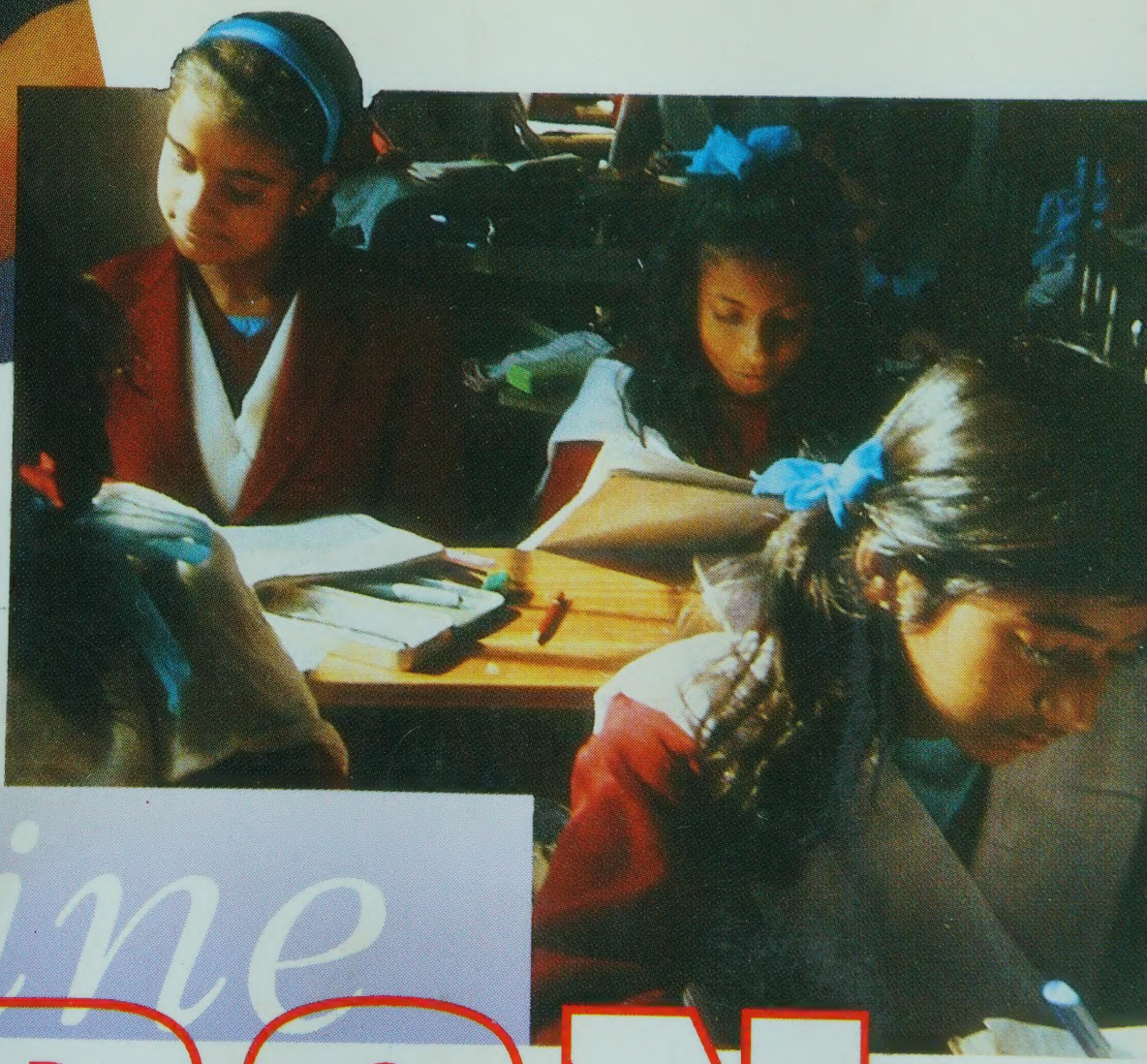
Curriculum Development

in

MICRONUTRIENT MALNUTRITION



iodine

IRON

Vitamin A

06440

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Curriculum Development *in* MICRONUTRIENT MALNUTRITION

Proceedings of the workshop on
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Curriculum Development for schools"
All India Institute of Medical Sciences
New Delhi - 110 029, India
30th March, 1996

Organised by:

International Council for Control of
Iodine Deficiency Disorders
(ICCIDD)

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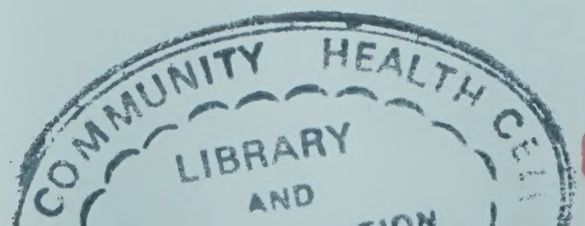

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TO THE GLOBAL PARTNERSHIP DEDICATED TO THE ELIMINATION OF IODINE DEFICIENCY DISORDERS

An Ancient Scourge of Mankind

The People of the affected countries
The Governments of the affected countries

The Salt Producers of each country

The International Agencies-especially
The World Health Organization
The United Nations Children's Fund
The World Bank

The Micronutrient Initiative
Program Against Micronutrient Malnutrition

Kiwanis International

The International Expert Network of
International Council for Control of
Iodine Deficiency Disorders
(ICCIDD)

The Bilateral Agencies especially
The Australian Agency for International Development
The Canadian International Development Agency
The Netherlands Ministry for Development Cooperation
The Swedish International Development Agency
The United States Agency for International Development

The International Council for Control of Iodine Deficiency Disorders (ICCIDD) is a non-profit non governmental organization dedicated to the sustainable elimination of Iodine Deficiency Disorders (IDD) throughout the world. The ICCIDD was granted an official status as an International NGO at the 47th World Health Assembly held in Geneva in 1994. It's activities are supported by donations/ grants from the Australian Agency for International Development (AusAID), the Canadian International Development Agency (CIDA), the Micronutrient Initiative (MI), the Netherlands Ministry for Development Cooperation, the Swedish International Development Agency (SIDA), the United Nations Children's Fund (UNICEF), the United States Agency for International Development (USAID), the World Bank, the World Health Organization (WHO), and others.

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The Workshop could not have succeeded without the active interest of the participants. We thank them for sharing their knowledge with us.

We are indebted to Prof. Lalit M. Nath, Director, AIIMS for his perceptive comments and valuable suggestions that helped shape the Workshop, and for agreeing to be Chief Guest. Thanks are also due to departments of AIIMS - specially Community Ophthalmology, R.P. Centre, Haematology and the Centre for Community Medicine for sharing technical expertise.

Above all we are grateful to Prof. V. Ramalingaswami for agreeing to write the Foreword.

We are grateful for the technical and logistical support extended by the ICCIDD.

Dr. Chandrakant S. Pandav convenor of the workshop was trained as an International Clinical Epidemiology Network (INCLEN) Fellow (Health

Economics; Level - II) at the Department of Clinical Epidemiology and Biostatistics and Centre for Health Economics and Policy Analysis (CHEPA) at McMaster University Hamilton, Ontario, Canada. We would like to place on record our acknowledgement to the INCLEN Programme.

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Dr. Chandrakant S. Pandav
Dr. K. Anand
Dr. Shashikant

Preface

Micronutrient malnutrition means deficiencies of those dietary components which are needed in minute quantities but which at the same time are vital for the well-being of humans. The three nutrients which are currently included in this are Iodine, Iron and Vitamin A. All the three deficiencies are responsible for a considerable degree of avoidable morbidity and mortality in India.

The current scientific knowledge is sufficient to achieve elimination of these disorders. However, this knowledge has not readily translated itself into action in India and other developing countries. This is possible only by creating awareness and generating consumer demand for these services. Scientists alone cannot achieve this. It is necessary to build a partnership of all the relevant stakeholders so that a concerted effort can be launched.

The school system has been identified as one such stakeholder. Not only are school children one of the most, vulnerable groups for these disorders but today's children are tomorrows parents. It is vital that these children inculcate correct practices from a young age. Thus, inclusion of information regarding micronutrient malnutrition in their school curriculum would be a good and permanent way to improve their knowledge. This workshop was the first step towards achieving this objective.

Though the intended finished product of the workshop was an updated curriculum, the participants

especially from the education department, felt that it will be too "prescriptive" therefore, the recommendations have been restricted to identifying the areas needing modification and the suggested modifications.

With the co-operation that we have received from all concerned sectors, we hope that the ultimate goal of elimination of micronutrient malnutrition from India will become a reality.

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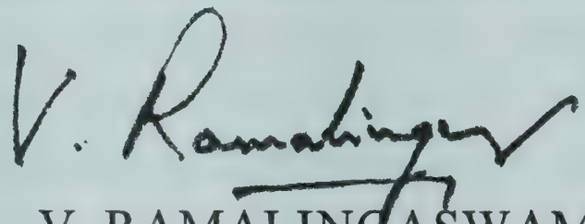
Foreword

It is generally agreed that school education had not been very successful in preparing our young people for socially and economically productive lives and for good citizenship and for a good society. Efforts are being made in the country to shift the focus of learning from a stereotyped and memorised corpus of knowledge to one that challenges children to reach their fullest potential. Reforms are often resisted, not because they are not needed, but on grounds that they are too sudden or too radical. An approach of gradualness is advocated, which is good in itself, but it often ends up in being too gradual to make a perceptible difference. In introducing reforms, teacher preparation and teacher enthusiasm are the key to success. I am so glad that school teachers were actively involved in this instance and care was taken not to overload, but to reorient the curriculum.

I welcome the initiative taken by the ICCIDD to reform school curricula by incorporating knowledge of micronutrients, essential for growth and development and essential for life itself and how deficiency of these nutrients can be avoided through inculcation of scientifically sound food habbits. The biological functions that Vitamin A, Iron and Iodine perform in the human body from the very start of life as well as the adverse conse-

quences to health that follow when they are not taken in sufficient quantities form a fascinating theme in human biology. From my own experience, I can say that school children are thrilled by exposure to such learning experiences. Such learning experiences provide the foundation for generating the scientific temper across the nation. The deleterious effects of deficiency of these nutrients are widespread among children throughout the developing world. We are yet to realise the power of child to child programmes through knowledge not only for conquering malnutrition but also for overall health development.

Dr. C.S. Pandav and his colleagues, Dr. K. Anand and Dr. Shashikant must be complimented for taking such a valuable initiative.



V. RAMALINGASWAMI
National Research Professor

New Delhi
27th May, 1997

1

Background Information

Dietary deficiencies of vitamins and minerals which are life-sustaining nutrients and are needed only in small quantities (hence,"micronutrients"), cause learning disabilities, mental retardation, poor health, low work capacity, blindness and premature death. The result is a devastating public health problem: about one billion people, almost all in developing countries, are suffering from the effects of iodine, vitamin-A and iron dietary deficiencies, and another billion are at risk of falling prey to them.

Iodine has been depleted from the soil in many parts of the world. In those areas, five to ten offspring of every 1,000 pregnant women who do not eat seafood or otherwise get no iodine (such as through iodine-fortified salt), are dead upon birth or soon thereafter. Many of those who survive are cretins, mentally retarded, and with low life expectancy. Many others are deaf, mute, or mild to moderately retarded. Iodine deficiency in adults reduces work potential. In India, it is estimated that the number of persons suffering from goitre is 79 million and the population residing in iodine deficient areas is 270 million.

Vitamin A is found in fruits and vegetables, liver, and breast milk. Humans need less than one-thousandth of one gram of it per day, but more than 13 million people

suffer night blindness or permanent blindness for lack of it. It is estimated that a total of 600,000 children in India are suffering from vitamin A deficiency.

Iron is found in red meat and breastmilk. It also exists in grains, legumes, and vegetables, but in a form less easily absorbed, unless taken at the same time with meat or foods rich in vitamin C. Thus diets of grains, legumes, and vegetables in developing countries are often deficient in absorbable iron. A less-severe deficiency of iron in the pre-school years, even if corrected, permanently reduces the manual dexterity of children, limits their attention span, and shortens their memory capacity. In India, anemia prevalence among school age children is 37 per cent; among non-pregnant women it is 35 per cent and among adult males it is 18 per cent. Prevalence of anemia among pregnant women has been reported to be in excess of 75 per cent.

The 1990 Summit for Children endorsed three micronutrient goals for the end of the decade: the virtual elimination of iodine and vitamin A deficiencies and the reduction of iron deficiency anemia in women by one-third. The goals were reaffirmed in 1991 at the Ending Hidden Hunger conference and in 1992 at the International Conference on Nutrition. The goals are achievable only if political will, state-of-the-art technology, and private, public, and international resources are marshalled for the effort.

The alleviation of poverty and the strengthening of national health care systems alone cannot solve the

problem of micronutrient deficiencies. As the micronutrient content of foods is a hidden property, consumers do not automatically demand micronutrient-rich foods. Even with the most nutritionally enlightened economic development plan, developing countries must still take direct action for micronutrient malnutrition elimination through consumer education, distribution of pharmaceutical supplements, and the fortification of common foodstuffs.

Fortunately, all of these options are inexpensive and cost-effective as can be seen from Table - 1. The particular mix of interventions chosen depends on country conditions. But the key constraints to achieving the summit goals are a lack of awareness and commitment of policy makers and consumers, a weak capacity to deliver supplements and education, and a lack of enforcement of industry compliance with fortification laws.

Beyond the immediate political feedback they provide, programmes to educate, persuade, and change the behaviour of consumers are essential to the long-run elimination of micronutrient deficiencies. Subconscious consumer demand for micronutrients needs to be made conscious and directed to appropriate foods and pharmaceuticals. This demand will serve as a "pull" factor to bring the target groups to distribution points for supplements, to overcome resistance, and, if necessary, to induce consumers to pay a little more for a better (that is, a fortified, although unfamiliar) diet. Social marketing of micronutrients and micronutrient-rich foods is necessary in virtually all developing countries, even where health service delivery is good and the food industry is well developed.

Table 1. *Costs of Micronutrient Control Programmes*

Micronutrient	Country/year	Estimated cost in US$/person (1994)	Estimated cost per person per year of protection (1994 $)
IODINE:			
Oil injection	Peru 1978	2.75	0.55
Oil injection	Zaire 1977	0.80	0.17
Oil injection	Indonesia 1986	1.25	0.25
Water fortification	Italy 1986	0.05	0.05
Salt fortification	India 1987	0.02-0.05	0.02-0.05
VITAMIN A:			
Sugar fortification	Guatemala 1976	0.17	0.17
Capsule	Haiti 1978	0.27-0.41	0.55-0.81
Capsule	Indonesia/ Philippines 1975	0.25	0.50
IRON:			
Salt fortification	India 1980	0.12	0.12
Sugar fortification	Guatemala 1980	0.12	0.12
Sugar fortification	1980	1.00	1.00
Tablets	1980	3.17-5.30	3.17-5.30

Source: Levin, Pollit, Galloway, and McGuire 1993.

Note: The above table is reproduced from Enriching Lives - Overcoming Vitamin and Mineral Malnutrition in Developing countries a A World Bank Publication, 1994.

The tools to correct micronutrient malnutrition are well understood and technically easy to apply-supplementation, fortification, and dietary change-through education and food diversification. The costs are low and the payoffs large. But designing a programme on the basis of cost-effective technology does not determine the success of the programme. A programmes success is ensured only if the people it targets are aware that it fulfils these essential requirements, hence the necessity of introducing information on micronutrient malnutrition in school curriculum, so that school children, recognizing the importance of a diet rich in micronutrients, ensure its availability for themselves and hopefully the next generation.

A review of micronutrient programmes around the world points to the creation of demand as the indispensable factor for success. Creating demand is a matter of modifying behaviours by easing resistance to dietary change through education, demonstration, and advocacy and by providing motivation to seek such change. Leaders must be motivated to support nutrition programmes; beyond them, health care workers, teachers, the business community, mothers, and consumers at large must demand the supplements, nutrient-rich foods and fortified foods that deliver good nutrition.

[Adapted from Enriching Lives - Overcoming Vitamin and Mineral Malnutrition in Developing Countries A World Bank Document, 1994]

2

Workshop Objectives

2.1 To review the existing school curriculum with respect to content of micronutrient malnutrition i.e. Iodine Deficiency Disorders, Iron and Vitamin A in India.

2.2 To prepare technical background papers on Iodine Deficiency Disorders, Iron and Vitamin A in India.

2.3 To update the existing school curriculum with appropriate modifications; based on the input received from the objectives (2.1) and (2.2) .

3

Workshop Methodology

The methodology followed for the Workshop has been described in three parts: Preparatory phase, Execution Phase and Proposed follow up action.

3.1 Preparatory Phase

A preparatory meeting was held at the Centre for Community Medicine, AIIMS to discuss the issues involved and the methodology required to incorporate necessary modifications in the school curriculum. For this purpose, the relevant team members were identified. They were the representatives of:

- DCERT (District Council for Educational Research and Training)
- SCERT (Staff Council for Educational Research and Training)
- NCERT (National Council for Educational Research and Training)
- School Health, Directorate of Health Services, Delhi

- Directorate of Education
- Principals of Schools
- Science Teachers and
- Medical Scientists

3.1.1 Preparation of Background Document

It was decided that a workshop should be held for this purpose where experts from all these groups can discuss and develop recommendations on micronutrient malnutrition for inclusion in school curriculum. As many of the concerned non-medical experts would not be familiar with the information regarding micronutrients, it was decided that a background document should be prepared for all the three micronutrients namely, iodine, iron and vitamin A. This background document would serve as the basis for discussions during the workshop. Three faculty members from AIIMS were identified for preparing the background document. They were Dr. K. Anand from the Centre for Community Medicine for Iodine, Dr. Sanjeev Gupta from the Community Ophthalmology, for vitamin A and Dr. Sunita Ahlawat from the Department of Hematology, for Iron. A meeting was held between the above identified experts, Dr. Sushma Seth from SCERT and Dr. Shashikant,Co- ordinator of the workshop, to finalise the format of background document. This was done to ensure uniformity in preparation.

Once the document was prepared, it was circulated among the above five people and the necessary modifications were carried out.

3.1.2 Pre and post testing of school teachers

A pre and post test exercise on micronutrients was carried out on school teachers. A total of 12 science teachers from different government schools of Delhi were invited to AIIMS. They were pretested on their knowledge about micronutrients. The teachers were then given copies of the three background documents. A test was done after they had read the background documents. They were also asked to give their opinion of the content adequacy, appropriateness of language, clarity of concept and any other suggestion. Based on their feedback, the background document was revised. The background documents are included in this report as Annexures. The results of this exercise were presented to the workshop participants.

3.2 Execution Phase

3.2.1 Inaugural Session

Dr. Chandrakant S. Pandav, Regional Coordinator, South Asia & Pacific, ICCIDD and Additional Professor, Centre for Community Medicine, welcomed all the participants of the workshop. Dr. Shashikant explained the objectives of the workshop, the modus operandi and the expected outcome of the workshop. Prof. Lalit M. Nath, Director, AIIMS, in his inaugural speech, emphasized the need for the people to take upon themselves the responsibility of being healthy, rather than depending upon the

government sources. He was glad that the present workshop, to educate the future parents, was a step in the right direction.

3.2.2 Technical Presentation

The inaugural session was followed by a presentation by Dr. Suman Bhatia. She reviewed the existing nutrition related content at various levels in school curriculum. Subsequently Dr. Anand, updated the group about key information on micronutrient malnutrition which needed to be kept in mind while deciding modifications in curriculum content.

3.2.3 Formation of Working Groups

The participants were then divided into three separate groups with representation from both education and medical field. Each group was responsible for the technical deliberations on one micronutrient and had three hours to deliberate upon it. The chairperson and rapporteur were selected by the members from among themselves. The group was supplied with the revised background document prepared by the joint team of SCERT and AIIMS, along with the relevant books prescribed for school children of Delhi. After deliberations, the rapporteur presented the recommendations of the group.

It was unanimously agreed that the **emphasis should be on modification and not addition**, as the school curriculum is already over burdened. It was decided that the information provided should be complete at each level of schooling i.e. Primary, Secondary and Higher Secondary schools.

Though the intended finished product of the workshop was an updated curriculum, the participants especially from the education department, felt that it would be too "prescriptive". Therefore, the recommendations have been restricted to identifying those areas needing modification and the suggested modifications in the respective areas. It is hoped that the suggested modification will be accepted by the concerned authorities and the appropriate changes carried out.

3.3 Proposed Follow-Up Action

After the presentation of Working Group reports, the proposed follow up action recommended was:

3.3.1 To pre-test the updated curriculum.

3.3.2 To initiate the process for inclusion of the final curriculum.

4

Review of the Existing School Curriculum and Recommendations

The curriculum content of Class III to Class X was reviewed by Ms. Suman Bhatia, DCERT. The adequacy of information and presentation of topics related to nutrition in general and micronutrients in particular was critically analysed. The recommendations to improve the existing curriculum are given class wise. The major focus of the recommendations is carrying out a series of activities in the school and at home.

Observations and Recommendations

Class III

Observations

1. The functions of food are mentioned. The food items have been classified into three categories i.e. energy giving, body building and food items that keep the body healthy.

2. The term vitamin is mentioned for the first time under the heading of "protective food".

3. Terms like "Fibre" have been used.

Recommendations

1. Teachers help the children to make a list of the food items that they eat everyday - foods which children eat in the morning, during the day and at night.

2. Teachers help the children in preparing a list of food items that

   a) provide energy,
   b) make them grow,
   c) keep them healthy.

3. Classification of foods they eat everyday under the three main groups.

4. Children are asked to list certain foods which cannot be eaten in raw form and those which can be eaten in raw form and compare their nutritional value. Then food is classified in three groups such as foods eaten raw, cooked and both cooked and raw.

Extended activity at home/outside school for children

1. Visit the market place to observe different food items sold. Make a list of 30 items and group them.

2. Plan a weekly food chart from locally available foods. Select foods from all the three groups.

3. Make a list of food items you eat everyday. Group these into energy giving food; body building food and protective food. Find out if you eat food from all these groups.

Class IV

Observations

1. The classification of food items is refined and terms like carbohydrate, fat and protein have been used.

2. The concept of a balanced or mixed diet is presented.

3. The term "nutrient" has been introduced.

4. "Mineral" is mentioned for the first time.

Recommendations

1. Children are asked to list food items that are rich in proteins.

2. List food items which contain carbohydrates.

3. List individuals who need more energy giving and body building foods.

4. Children compare diets of three families. List the methods of cooking food and advantages of balanced diet.

Extended Activity - Outside School

1. Name six food items which you eat in the raw form as well as in the preserved form.

2. Visit five families in your neighbourhood. Find out their daily diet. Find out which food groups are lacking in their diet.

3. Plan a weekly meal chart for your family. Include food from all food groups.

Class V

Observations

1. Deficiency diseases and their control has been introduced.

2. Detail of vitamin A is presented.

3. Iodine and iron are not mentioned.

4. Food requirements are touched upon.

Recommendations

1. Study the table of recommended dietary allowances. Find out what kind of food he/she should eat everyday. Also find out how much food a vegetarian and a non-vegetarian should eat. Compare it with his own food intake and find out the deficiencies.

2. Protein Energy Malnutrition - Symptoms, Causes

Activity: Measurement of mid-arm circumference using Shakir's tape.

3. Deficiency Diseases related to Vitamins and Minerals, Night Blindness causes, symptoms and prevention

Activity: to detect night blindness by selection of a pair of cards from a pile - first in light and then in a darkened room.

4. Vitamin B, Vitamin C, and Vitamin D deficiency - their signs, symptoms and preventive measures that can be taken.

5. Activity: Deficiency diseases can also occur due to faulty food beliefs and practices. To find these - make a list of food beliefs and practices followed by your family. Find out which of these are beneficial and which are harmful.

Extended Activity at home/outside school

1. Identification of Vitamins in medicinal preparations

2. Preparation of low-cost foods from locally available materials to provide carbohydrates, proteins, fats and vitamins.

3. Survey of some children in the locality to detect Night Blindness

4. Preparation of posters and slogans for preventing deficiency diseases.

Class VI

Observation

1. No chapter on nutrition per se.

2. No mention of vitamin / mineral.

3. Term "food chain" is introduced.

Recommendations

Nil

Class VII

Observations

1. Components of food are discussed in detail.

2. Terms "calories" and "enzymes" have been used.

3. Vitamins and minerals are discussed in detail.

4. Iodine has been introduced for the first time.

5. Sources, chemistry and functions of carbohydrates, fats and proteins.

Recommendations

1. To study and improve their own diet with respect to a balanced diet.

Class VIII

Observations

1. Minerals are mentioned in some detail.

Recommendations

Nil

Class IX

Observations

1. A description of the endocrine gland is provided.

2. There is no chapter on nutrition per se.

Recommendations

Nil

Class X

1. A balanced diet is discussed in detail.

2. Sources, chemistry and function of constituents of a balanced diet are discussed.

3. The recommended daily allowance of constituents of a balanced diet is given.

Recommendations

1. Discussion of factors leading to deficiency in micronutrients

2. Lack of resources, ignorance and faulty cooking methods

3. Methods for improvement of nutritive contents of diet-sprouting, fermentation, parboiling and improved methods of cooking.

5

Recommendations of the Working Groups

The recommendations of the three working groups on Iodine Deficiency Disorders, Iron deficiency anemia and Vitamin A deficiency are listed below.

5.1 Iodine

The Working Group on Iodine comprised of the following members:

1. Lt. Col. R. Sankar
2. Dr. Y.K. Joshi
3. Dr. S.K. Bhasin
4. Dr. Sushma Kiran Sethia
5. Ms. Neelam Bhatia
6. Ms. S. Jassal
7. Mr. Notiyal

Observations, Discussions and Recommendations

A brief discussion on iodine deficiency disorders and the magnitude of the problem in our country was first presented to the group.

The group systematically and critically reviewed the text books of different classes with respect to the portions on micronutrients in general and iodine in particular.

The group felt that children are now-a-days overburdened with information explosion. Therefore it was decided that addition of new information should be limited to the minimum. The emphasis should be on presenting the information crisply and with clear messages.

At the outset the group, unanimously agreed, to focus their effort on critically analysing the contents and presentation of the topics related to iodine as a micronutrient.

The group felt that the presentation of micronutrient deficiencies as a whole will go a long way in making a lasting impression on the minds of children.

The groups findings and recommendations class-wise are given below:

Class III

- A picture of an iodised salt packet may be included with the other food items that are shown in pictorial form.

Class IV

- A picture of an iodised salt packet may be included with other food items that are shown in pictorial form. This will be a reinforcing effort.

- Suggested activity for the child is to check whether the salt packet at home bears the logo that is shown in the book.

Class V

- It is suggested that iodine and iron deficiency should be introduced at this stage.

- The portion on vitamin A may be pruned and reduced.

- In the subject on Environmental Sciences, it is suggested that iodine may be introduced. Iodine leaching from the upper crust of earth may be mentioned in the chapter on soil.

Class VI

- There is no chapter on nutrition per se for this class. The group felt that there was no need to disturb the existing curriculum by introducing the subject of micro-nutrients here.

Class VII

- Iodine is introduced for the first time. The group felt that no major change was required in the format.

Class VIII

- Minerals are mentioned in some detail. However, they should be put in the right priority.

- Introduce iodine in one paragraph. Mention here in simple terms the iodine deficiency disorders.

Class IX

- There is a description of endocrine glands.

- Emphasis should be made here on the role of iodine for normal functioning of the thyroid gland and the importance of thyroid hormones for normal mental and physical development.

Class X

- How to test iodine in salt may be introduced at this stage.

- A paragraph on iodine deficiency disorders may be introduced.

- Mention of the National IDD Control Programme should ideally be introduced at this stage as a passing remark.

- Emphasis on iodine supplementation through iodised salt and the importance of sustaining the programme should be touched upon.

5.2 Iron

The Working Group on Iron comprised of the following members:

1. Dr. Shashi Prabha Gupta
2. Dr. H.P. Pati
3. Dr. Shukla Bhattacharya
4. Dr. Jenifer Lobo
5. Ms. Divya Verma
6. Dr. Yogesh Jain
7. Ms. S.V. Mallik

Observations, Discussions and Recommendations

The group decided to discuss the curriculum **objectives** and **strategies** under three school levels

i) Classes III - V
ii) Classes VI - VIII
iii) Classes IX and above

It was also felt that the group should only suggest/recommend what objectives/information content be incorporated in the curriculum; and to leave the language/format of presentation to education experts. It decided against "nit-picking" of existing flaws and lacunae in the NCERT textbooks with regards to micronutrient information.

Classes III - V

Objectives

1. Importance of minerals and vitamins for health especially 'iron' should be mentioned.

2. Sources of food rich in iron identified.

3. Main symptoms and signs of anemia described.

4. Importance of sanitation with reference to worm infestation.

5. Tabulate the sources of iron: both vegetarian and non-vegetarian sources.

Strategies

1. Illustrations, activities to identify the sources of food rich in iron.

2. List iron rich foods.

3. Illustrations of deficiency signs and symptoms:pallor, fatigue and tiredness.

4. Use of foot wear particularly in the field : illustration

Classes VI - VIII

Objectives

The following should be included into the curriculum.

1. What is the role of iron in the body?
2. What are the causes of iron deficiency?
3. What is anemia?
4. How can anemia be recognised?
5. What are the consequences of anemia?
6. Can anemia be cured?
7. What are the sources of iron?
8. How to prevent iron deficiency anemia?

Strategies

1) Written curriculum
2) Nutritional games
3) Stories
4) Quiz
5) Project work
6) School garden activities
7) National Service Scheme (NSS) and Socially Useful Productive Work (SUPW): ½ day/month on community work on iron.

Classes IX and above

Objectives

1. Information on the Magnitude of the problem-
   Global burden,
   National burden,
   Cause specific mortality due to Iron deficiency.

2. How anemia affects various stages of life viz antenatal mother, young infant, older infant, pre-school and school age children with a special emphasis on its impact on women.

3. Ways of iron deficiency management
   - stress on iron supplementation,
   - food fortification,
   - dietary diversification.

Strategies

1) Written curriculum

2) Nutritional games

3) Stories

4) Quiz

5) Project work

6) School garden activities

7) National Service Scheme (NSS) and Socially Useful Productive Work (SUPW): ½ day/month on community work on iron.

5.3 Vitamin A

The Working Group on Vitamin A comprised of the following members:

1. Prof. S.K. Angra
2. Dr. S.K. Kapoor
3. Dr. Nargis Jaffery
4. Dr. Sanjeev Gupta
5. Ms. Suman Bhatia
6. Ms. Nilima Sharma
7. Mr. B.K. Bhagat

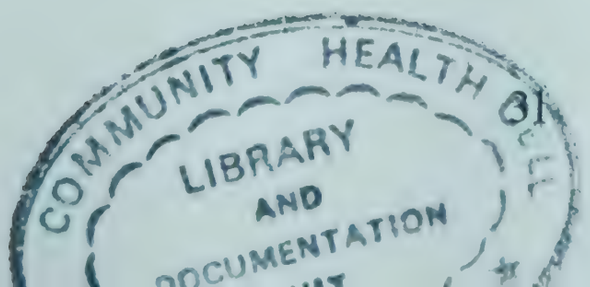
Observations, Discussions and Recommendations

The group unanimously felt that the draft module prepared and discussed could be incorporated in the school curriculum, with the minor modifications suggested. This module should be completed from class III to class IX.

The class wise distribution of topics and important points are as follows:

Class III

- Incorporate the Vitamin A rich food items in the existing list of foods to be consumed with illustrations. However, no mentionneed be made of the term 'Vitamin A"



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Class IV

- 'Vitamin A' term to be introduced along with other vitamins with the help of illustrations. Importance to be mentioned.

Class V

- In the existing composite table of various vitamins, Vitamin A should also be included and its deficiencies discussed in the table. The daily allowance in terms of quantities of food items should also be mentioned.

Class VI

- Synopsis/Refresher of what has been included in classes III to V. The effects of deficiency may also be mentioned.

Class VII

- The classification of sources of vitamin A in plants and animals may be done. The daily allowance in terms of units should be included. The term "carotene" should be introduced.

Class VIII

- The absorption of vitamin A, the lack of it in a diet, and its relation to deficiency development need to

be discussed in brief. The magnitude of the problem in India has to be mentioned.

Diagnosis in siblings or younger students should be introduced as a project.

Class IX

- Government efforts, prophylaxis and treatment schedule with a word about hypervitaminosis A.

Class X

- Status quo to be maintained. No additions/ modifications were felt necessary as students will already be under pressure of examinations.

Training of teachers

- The duration for the orientation of the teachers should be 2-3 hours for vitamin A alone.

- Slides and Over Head Projector (OHP) should be used. Group discussion should be incorporated in the orientation of teachers.

6

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Bibliography

1. B.S. Hetzel, The story of Iodine Deficiency. An International Challenge in Nutrition. Oxford University Press; Delhi, 1989.

2. B.S. Hetzel, C.S. Pandav (eds), S.O.S. for a Billion: The conquest of Iodine Deficiency Disorders. Oxford University Press; Delhi, 1996.

3. Delhi - I.D.D: Prevalence of Iodine Deficiency Disorders Among School Children of the National Capital Territory of Delhi, 1996.

4. Delhi - Salt: Use of Iodised Salt in the Households of students of Government Middle Schools of the National Capital Territory of Delhi, 1996.

5. Enriching lives - overcoming Vitamin and Mineral Malnutrition in Developing countries. A World Bank Publication 1994.

6. Vitamin A supplements: A guide to their use in the treatment and prevention of Vit. A deficiency and xerophthalmia. Prepared by WHO / UNICEF / IVACG, Task Force, 1988.

7. Prevention and Treatment of Vitamin A Deficiency, Ministry of Health & Family Welfare, Government of India 1990.

8. De Maeyer D.M., Preventing and controlling iron deficiency anaemia through Primary Health Care - A guide for health administrators and programme managers. WHO 1989.

9. National Child Survival & Safe Motherhood Programme: Programme interventions. Ministry of Health & Family Welfare, Government of India, New Delhi, June 1994.

8

Annexure 1

Background Documents

These documents were prepared to provide the necessary technical details which need to be kept in mind while formulating the curriculum. In order to have uniformity, the concerned experts discussed the format of the document. The format adopted was as follows.

1. Role of micronutrients in the body
2. Sources of micronutrients
3. Requirements of the micronutrients
4. Cause of micronutrient deficiencies
5. Effects of micronutrient deficiencies
6. Magnitude of problem in India
7. Treatment of deficiency
8. Prevention of deficiency
9. Government efforts for its control
10. Teachers role in the control of deficiency
11. Teaching audio visual aids

After the initial draft the documents were circulated amongst the experts and modified accordingly.

8.1 Iodine Deficiency Disorders

Dr. K. Anand, Centre for Community Medicine, A.I.I.M.S.

Role of iodine in human body

Iodine is an essential element for normal growth and development in animals and man. It is one of the halogens with a relatively high atomic weight of 127. The special biological importance of iodine arises from the fact that it is a constituent of thyroid hormones.

Thyroid is a bilobed gland situated at the centre of the neck. Each lobe is situated on either side of the windpipe and attached to 'it'. It is an endocrine gland (unlike exocrine glands eg. sweat), and produces hormones which are called Tri-iodo thyronine (T_3) and Tetra-iodo-thyronine or Thyroxine (T_4). As is evident from the name T_3, it has three iodine atoms and T_4, four iodine atoms.

The healthy human adult body contains 15-20 mg of iodine of which 70-80 per cent is in the thyroid gland. The thyroid gland weighs 15-25 gms.

Iodine is rapidly absorbed through the gut which then enters the blood stream. From the blood, the thyroid gland "traps" the iodine and remaining is then, excreted by the kidney by passive diffusion. The level of excretion of iodine in urine is a measure of iodine intake and hence can be used to assess iodine deficiency.

The thyroid gland needs about 60 µg of iodine per day to maintain adequate supply of thyroxine. The trapping of iodine by thyroid is dependent on an active transport

mechanism which is regulated by Thyroid Stimulating Hormone (TSH), a hormone secreted by the pituitary gland.

Normal thyroid gland function is essential for normal growth and development of almost all organ systems. It's action is mediated through gene expression which results in increased synthesis of new protein, enzymes or by activation of existing enzymes. The sensitivity of different organs to thyroid deficiency varies.

The thyroid hormones are essential for the various metabolic activity in the body.

Source

Iodine occurs in nature predominantly in the oceans and the soil. Iodine was originally abundantly present in the soil. However, over the centuries, large amounts were leached from the surface soil by snow, rain, wind and floods. Thus the soil gradually becomes iodine deficient. Iodine is now present only in the deeper layers of soils. The concentration of iodine in sea water is about 50-60 µg/L. All crops grown in these iodine deficient soils will be iodine deficient. It is important to note that, "no single plant" is a good source of iodine. However as sea water is a good source of iodine, sea weeds and sea fish/animals are a good source of iodine. These are eaten only by selected communities/population.

Requirement of Iodine

As mentioned above, the thyroid gland needs to trap from circulation about 60 µg of iodine per day. To

get this amount of iodine, one must consume about 100-150 µg of iodine per day. It is essential that iodine should be taken in this small amount everyday and cannot be consumed at one time. During adolescence and pregnancy the requirement of iodine increases as the basal metabolic rate increases.

Cause of Iodine Deficiency

Prolonged consumption of food deficient in iodine will result in iodine deficiency. All foods grown in iodine deficient soil will be poor in iodine. This is more so in hilly regions where the soil is grossly deficient in iodine. This accounts for the fact that, in India, the areas where iodine deficiency is the most severe is the sub-Himalayan belt.

Iodine deficiency can also occur if some chemicals interfere with its "trapping" by thyroid. This is a relatively rare cause of iodine deficiency.

Physiological Consequences and Clinical Manifestation

The physiological consequences depend on the age at which the deficiency occurs.

Fetal :

Fetal brain is most sensitive to thyroid hormones. Iodine deficiency at this age prevents the brain from full development. This results in a wide range of defects from mental deficiency to deaf mutism and paralysis of limbs to varying degrees. These defects are irreversible. This is

called "CRETINISM". Iodine deficiency during pregnancy can result in abortions and stillbirths. Similar consequences have been seen in animals as well.

Infancy and Childhood :

Iodine deficiency affects the developing brain and can have various consequences, like impaired mental functions and retarded physical development. In general, children living in iodine sufficient area have better intelligence (Intelligence Quotient points), than comparable children living in iodine deficient areas. Iodine deficiency and resultant thyroid deficiency also has an impact on the development of bones and muscles and hence physical development.

Adolescence and Adults:

When there is iodine deficiency, the iodine available in the blood is not enough for the thyroid gland. As a result in an effort to trap more iodine, the thyroid gland enlarges. This is a compensatory effort on the part of thyroid gland, which continues to occur, till the deficiency lasts, resulting in "Goitre". If the enlargement is diffuse and the iodine deficiency is corrected at early stages, the goitre is reversible. Cretinism and goitre are the most easily recognizable consequences of iodine deficiency. However, even in the absence of such recognizable signs, a person can be iodine deficient. This "sub clinical" iodine deficiency has serious consequences in terms of educability and physical performance.

Magnitude of Problem:

Iodine deficiency is the world's greatest single cause of preventable brain damage and mental retardation. As already said, iodine deficiency is manifested clinically as cretinism, goitre, and mild motor and mental deficiency. The estimated number of these disorders is given below.

Disorder	World	India
Goitre	655 million (13%)	79 million
Population residing in iodine deficient area	1,572 million (28.9%)	270 million

India

IDD poses a problem all over India. Out of the total 479 districts in the country, 255 have been surveyed for IDD. IDD is a public health problem in 222 districts. All the states surveyed till now have an IDD problem. The problem is the maximum in the sub-Himalayan states of Uttar Pradesh, Sikkim and the North Eastern states where goitre prevalence of more than 50 per cent has been found.

In addition to the numbers given above, another point to remember is the quality of life. As said before, iodine deficiency has a far reaching impact on the educability of children and hence on their adult mental and physical capacity. Thus the overall impact of IDD to a

community can not be measured in terms of only clinical manifestation of goitre and cretinism.

Treatment

Only early stages of goitre can be reversed by iodine supplementation. In general, IDDs can not be treated and can only be prevented. Large goitres can only be corrected by surgery.

Methods of Prevention

Four approaches are available for prevention and control of any micronutrient disorder:

1. Dietary modification

2. Supplementation of the nutrient

3. Fortifications of the nutrient

4. Public health measures such as treatment of the infections/infestations

Dietary modification

This means changing the diet of the population so that they consume more of the nutrient rich foods. However, this approach is not applicable for iodine deficiency, as all the foodstuffs grown in iodine deficient soil will be iodine deficient.

Supplementation of the nutrient

This means provision of the nutrient as a tablet or injection as is given for Iron. As the requirement of iodine is very small, daily supplementation is difficult. However iodized oil given orally or as injection is used for control of IDD. Due to its cost and problems in implementation, its use is currently limited to severely iodine deficient areas.

Fortification

This means adding the nutrient to a food stuff like salt, flour (Atta), milk, bread etc. That food stuff is chosen which is **regularly** consumed, by **all the sections** of the society. Salt qualifies as the most suitable "vehicle" for iodine. Adding iodine to salt does not change its colour or taste.

The amount of iodine to be added depends on the iodine requirement of the body and average amount of salt consumed per head by the community. In India it has been estimated that on an average, an individual consumes 10 gm of salt. Thus to provide 150 µg of iodine in 10gm of salt, the iodine which needs to be added is 15 parts per million 15 mg of iodine per kg of salt. [This can be given as a simple mathematical calculation to students themselves].

However, iodine is lost from salt if it is exposed to moisture and the sun light. Therefore, for the salt to retain the iodine at 15 ppm, it will need to contain more at the place of production. In India, it is recommended that salt should contain 30 ppm iodine at production site. However

efforts should be made at all levels to take adequate steps for containing iodine loss.

Some of these steps are:

1. Packing of salt is High Density Polythene (HDPE) bags.

2. Not selling/buying of loose/unpacked salt.

3. Not washing salt before use (This is a common practice with big crystal salts in many parts of India).

4. Keeping the salt in closed containers at home.

Even though only, 150 µg of iodine is required per day, consumption of iodine upto 20 times this amount does not result in any harmful effect. Thus, iodised salt is quite safe to use.

Treatment of infections

This approach is applicable to Vit. A deficiency and Iron deficiency. Worm infestation impede the absorption if micronutrients and recurrent infections drain the body store. However, this approach is not relevant to Iodine Deficiency.

Government Efforts

The Government of India recognized the need to control iodine deficiency disorders and started the National Goitre Control Programme in 1962. The method of control

chosen, was supply of iodized salt. This was based on the successful experiment in the Kangra Valley in Himachal Pradesh, where use of iodized salt reduced the goitre prevalence by almost half in a time of five years.

India is committed to Universal Salt Iodisation by 1995, so that IDD can be eliminated by 2000 AD. The states of Rajasthan, Gujarat and Tamil Nadu account for almost 95 per cent of salt produced in the country. The salt is then processed through salt iodisation plants where Potassium Iodate (KIO3) is added to the salt in the recommended quantities. The salt is then packed in HDPE bags and sent by Rail/Road to different parts of the country. All of the states have banned the sale of uniodized salt for human consumption.

Iodisation of salt for animal consumption is currently not required under law. As a result two types of salt are available in the market. The cost of iodised salt is about 0.50-2.00 rupee/kg higher than uniodised salt. This increase is mainly because of packing material rather than the iodisation. Therefore many people buy the cheaper salt. Thus for saving a few rupees each months, people who are unaware of the spectrum of disorders caused by iodine deficiency, run the risk of suffering from the serious consequences of iodine deficiency. As already mentioned, animals also suffer from serious consequences of iodine deficiency and iodization of salt for their consumption should be the next logical step.

Though the government has recommended the levels of iodine in salt, it is imperative that somebody actually measures the iodine content of salt at the retail sale level.

Food inspectors have the responsibility of ensuring this, but their effort needs to reinforced by the people.

Teacher's Role

You can help the cause of elimination of IDD from India by doing the following things:

1. Identify children in your class/neighbourhood who have thyroid enlargement(goitre). Advise them to consume iodised salt and refer them to a doctor.

2. Use iodised salt at home and advise your relatives / neighbours / friends to do the same.

3. Ensure that the salt labeled as iodised contains iodine by using spot testing kits. You can do this at home. You can ask children to bring salt from their homes on one particular day and test them for presence of iodine.

4. Evaluate whether the students know about IDD and the use of iodised salt.

5. Educate school students about IDD and the use of iodised salt.

8.2 Iron

Dr. Sunita Ahlawat and Prof. Manorama Bhargava
Department of Haematology, AIIMS

Role of Iron in the body

Iron is mainly required for synthesis of Haemoglobin, the oxygen transport protein that carries oxygen very efficiently to every part of the body.

Iron is also required in small amounts by many tissues for synthesis of non-haemoglobin iron containing enzymes and proteins among which are the cytochromes, catalase and myoglobin.

Sources of Dietary iron

Haem iron	Meat, fish, poultry and blood products provide 10-15 per cent of iron intake in developed countries. 10 per cent of total intake negligible in developing countries.
Non-Haem	Bioavailability - absorption 20-30 per cent
Food iron	Cereals, tubers, vegetables and pulses, especially green leafy vegetables, spinach, Mustard, salad and Tauri. Bioavailability - determined by the presence of enhancing and inhibitory factors.
Contamination Iron	Soil, dust, water, iron pots etc Bioavailability - low
Fortification	varying potential bioavailability

Finally iron absorption is related to the individual's iron status. More iron is absorbed by iron-deficient persons and less by those who are iron-replete. Unfortunately, this adaptive increase in iron absorption is not sufficient to prevent deficiency in people consuming diets typical of the developing world.

Iron Balance

Normally total iron content of the body tends to remain fixed within relatively narrow limits. It follows that losses of iron must be matched by the absorption of iron from food.

Iron requirement

The average intake of iron should balance the iron loss. Only 5 to 10 per cent of dietary iron is absorbed i.e. to absorb 1 mg/day, 10-30 mg of iron should be taken daily by an adult man. The proportion of iron absorbed is increased by 3 to 5 fold, if iron stores of the individual are depleted.

An adult man requires approximately 1 mg of iron/day. An adult female in the reproductive age group requires 2 mg of iron/day. In pregnant woman, although menstruation related iron losses are nil, additional iron is required for the fetus, hence iron supplementation is essential.

Infants, children and adolescents require iron for their expanding red cell mass and growing body tissues.

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Causes of iron deficiency anaemia

Iron deficiency is mostly caused by

- Dietary deficiency of iron

- Impaired iron absorption by gut

  a) Gastric surgery
  b) Pica (Eating mud)

- Increased iron loss is caused by

  a) Hook worm infestation,
  b) Excessive menstrual flow.

- Requirement increases during

  a) Infancy
  b) Pregnancy
  c) Lactation

Effects of micronutrient deficiency

In infants and children

- impaired language development and scholastic achievement,

- psychological and behavioural effects (inattention, fatigue, insecurity etc),

- decreased physical activity.

In adults of both sexes, it decreases the ability for

- physical work and therefore the earning capacity

In pregnant women, there is an

- increased maternal morbidity and mortality,
- increased fetal morbidity and mortality,
- increased risk of low birth weight baby.

Haemoglobin is the oxygen carrying substance. When haemoglobin levels are reduced, less oxygen is provided to the tissues resulting in reduced work capacity and physical performance. Alteration in iron containing enzymes results in impaired development and altered behavioral responses.

Prevalence and consequences of iron deficiency anaemia

It is estimated that about 30 per cent of the world's population is anaemic.

Young children and pregnant women are most affected, with an estimated global prevalence of 43 per cent and 51 per cent respectively. Anaemia prevalence among school age children is 37 per cent, non-pregnant women 35 per cent and adult males 18 per cent. It is estimated that the prevalence rate for adolescents is close to that for adult females. The rate for the elderly is slightly higher than that for adult males.

Iron deficiency anaemia is considerably more prevalent in the developing than in the developed

world. Africa and South Asia have the highest overall regional prevalence rates.

Treatment of iron deficiency

Therapy as such must rely on medicinal iron, since dietary changes alone cannot correct iron deficiency anaemia, especially when severe. The treatment of choice is oral administration of ferrous fumarate or gluonate or sulfate, parenteral administration being reserved for patients who are completely intolerant of oral iron. Only the most severe cases call for a blood transfusion.

Oral iron therapy

Iron tablets are freely available in all hospitals and primary health centres.

Liquid preparations

Liquid preparation are useful for administration to children.

Dosage

Adolescents and adults

Mild anaemia	1 tablet (60 mg elemental iron), per day
Moderate to severe	1 tablet twice a day

Pregnancy and lactation

1 tablet (120 mg iron + 500 ug folic acid) daily

Side effects

Oral iron sometime causes epigastric discomfort. A person taking oral iron also passes black coloured stools, does not warrant discontinuation of therapy, instead it is a proof that the person is taking iron.

Prevention

Four basic approaches to the prevention of iron deficiency anaemia are:

1. supplementation with medicinal iron,

2. education and associated measures to increase dietary intake,

3. control of infection,

4. fortification of staple food with iron.

Supplementation with medicinal iron

Pregnant women, pre-school children and school children should get medicinal iron supplements.

Governmental Efforts for Anaemia Control

The National Nutritional Anaemia Prophylaxis Programme (NNAPP) was launched in 1970. Since 1991, it has been redesignated as, "National Nutrition Anaemia Control Programme" (NNACP). Under this, iron and folic acid supplements are provided to under five children, pregnant and lactating women, adolescent girls and family planning acceptors. Adults are given tablets which contain 100 mg elemental iron and 500 µg folic acid and children tablets with 20 mg of elemental iron 100 µg folic acid. All the beneficiaries receive 100 tablets in a year. The tablets are distributed through the health workers and anganwadi workers.

The major behavioural changes required are compliance to supplementation, changes in cooking and eating habits; and measures for infection control, including better personal hygiene and more rational feeding of sick children. Educational messages are unlikely to succeed, unless they take into account the real motivation of the target group. When school children are a target group, the teachers are the best persons to impart this knowledge.

Teachers can disseminate knowledge to students and the community. They can also help in identifying the students with anaemia and help them in taking supplementation of medicinal iron. Above all they can sensitize the students to these problems and help them live better and healthier lives free from anaemia.

Audio visual aids

Evaluation of students can be done by posters or process competitions.

Project 1

To do a diet survey of 10 families and categorize the type of diet they are taking (low, intermediate or high bioavailability)

Project 2

Find out the food value of some of the commonly used fruits and vegetables.

Project 3

Find out the food value of commonly used cereals.

Project 4

Find out the immunization status of neighbourhood children.

Project 5

Find out in their neighbourhood, whether pregnant mothers are going to an Antenatal clinic and taking iron tablets.

Project 6

Diet survey of all children less than 5 years of age in the neighbourhood.

8.3 Vitamin A Deficiency

By: Dr. Sanjeev Gupta, Community Ophthalomology, AIIMS

Role of Vitamin A in the Human Body

Vitamin A has several important functions in the body. They are :

- it plays a crucial role in normal vision;
- it is needed for the health of epithelial cells, viz., mucous membrane and skin.
- it is connected with growth, specially skeletal growth;
- it protects the body against infections.

Sources of Vitamin A

- Animal sources : liver, egg yolk, butter, cheese, whole milk and fish.

- Plant Sources : fresh dark-green leafy vegetables such as spinach, amaranth, methi (fenugreek) and cabbage; coloured vegetables such as carrots and pumpkins; fruits such as mangoes and papayas. A daily intake of 100 gms of leafy vegetables is a simple and practical way of meeting the daily requirement of Vitamin A. Vegetable sources are required 2-6 times more than animal sources.

- Fish Liver Oils : Fish liver oils are the richest sources of Vitamin A, but may not be ordinarily available.

- Fortified foods : Vanaspati (Dalda) is fortified with Vitamin A & D.: Mother Dairy Milk.

Recommended Intake

The recommended daily intake of Vitamin A (Retinol) in micrograms (µg) is as follows :

• Man, Woman, Pregnant women	750
• Lactating women	1150
• Infants	300 - 400
• Children (less than 12 years)	250 - 600
• Adolescents (13-19 years)	750

One I.U. of Vitamin A is equal to 0.3 µg of retinol or 0.6 µg of beta-carotene.

Cause of Vitamin A deficiency

Vitamin A deficiency is caused when a person does not consume enough food stuffs containing vitamin A. In infants, mother's breast milk is a good source and non breast feeding or early weaning is an important cause of vitamin A deficiency.

Effects of Vitamin A deficiency

Vitamin A deficiency usually occurs among pre-school children (age 1-6 years of age). Vitamin A

deficiency most commonly affects the eyes. **Night blindness or inability to see in dim-light** is the earliest symptom of Vitamin A deficiency (called 'Ratoundhi' in Hindi). Parents may notice that the child stumbles or gropes for objects in dim light. It is important to know that this problem does not improve by wearing glasses.

Xerophthalmia :

It is a term used to describe the various ways in which vitamin A deficiency can present in the eyes of a patient. The conjunctiva is the thin transparent, outer-most membrane of the eye. Initially it becomes muddy, wrinkled and dry. Later, one may find grayish, triangular, foamy, rough and raised patches on the conjunctiva. These are called Bitot's spots. Finally, the cornea, which is the thin, transparent, watch-glass like membrane in the centre of the eye may also become dry and hazy. This is a serious condition, as are the subsequent ones. At this stage, the patient needs to be admitted to hospital.

Malnutrition :

Very often, vitamin A deficiency is associated with malnutrition. So, one should specially look for signs of vitamin A deficiency in under-weight children.

Infections :

Measles and diarrhoea are often associated with vitamin A deficiency, specially in a malnourished child because of poor absorption.

Magnitude of the Problem in India

The prevalence of clinical vitamin A deficiency among under-fives in India is 0.7 per cent. 'Clinical' means those children among whom there is some evidence of vitamin A deficiency like Bitot's spots etc. This does not include those children who may be suffering from vitamin A deficiency but which has not manifested as yet.

Thus, out of every 1000 children under the age of 5 years, 7 children have vitamin A deficiency. It is estimated that a total of 6,00,000 children in India are suffering from vitamin A deficiency (VAD).

Treatment of Vitamin A Deficiency (VAD)

The treatment of early or mild vitamin A deficiency is easy, simple, inexpensive and can be done at home. Oral vitamin A solution is available free-of-cost at all government hospitals, dispensaries and outlets. It comes in 100ml dark-brown coloured bottles. Each ml of this solution contains 1,00,000 (1 lakh) I.U. of the vitamin A (retinol). For treatment, we have to give 2 ml of this solution to the child on day 0, 1 and 7. This means that if the treatment is started on say the 14 th, first dose is given on the 14 th, the second on the 15 th and the third on the 21 st. These doses are given orally. Pure vitamin A solution is usually not available at chemist shops. However, in combination with other vitamins and micronutrients, it is available. It is also available in capsule form. However, the strength of the dose is important. If the capsule contains, say 50,000 I.U. of vitamin A, then four capsules have to be given at a time.

The capsule may be pricked with a needle, and the clear vitamin A solution fed to the child. Some people prescribe daily dosages of vitamin A but may be avoided as the compliance of the daily dose may not be adequate. The vitamin A bottle should be stored in a cool and dark place, away from sunlight. Excessive dosage may have harmful effects like diarrhoea.

The child needs to be admitted to hospital only if the deficiency is severe, e.g. if the cornea is affected or if there is an ulcer (wound) in the eye. No self medication can work at this stage.

The general health status should also be managed by advice on nutrition in all children suffering from this deficiency.

Prevention

Oral vitamin A solution :

Oral vitamin A solution is available free of cost at all government outlets. It is safe and easy to administer. The dose for prevention is 2 ml of the solution once every six months from the age of 1 year to 6 years. Below the age of one year, one dose of 1 ml may be given. No vitamin A solution may be given to an infant below the age of 6 months as the stores in the liver are adequate till this age.

Vitamin A capsules, as explained earlier, can also be consumed for prevention.

Dietary Modification :

Diet may be modified to include some of the vitamin A rich foods mentioned earlier. However, cost factors, cultural beliefs and practices must be taken into consideration in this regard.

Treatment of Infections :

Any fevers or other associated infectious diseases should be adequately managed.

Kitchen Garden :

Wherever possible one can be encouraged to grow vitamin A rich fruits and vegetables, for their own consumption, on a small-scale eg. near any water source.

Efforts of the government in prevention of vitamin A deficiency

Under the Child Survival and Safe Motherhood Strategy of the Government of India, Oral vitamin A solution is provided to all under-five children every six-months for prevention free-of-cost. Oral vitamin A solution is provided to all health workers in the rural areas for administration to the under-five children.

The Government of India started its National Vitamin A Prophylaxis Programme for the prevention of blindness in children in 1970 based on periodic massive dosing of children with 200,000 IU of retinol palmitate every 6 months.

Role of a Teacher in control of Vitamin A Deficiency (VAD) - The teacher can:

- Disseminate the knowledge she has acquired to her students, family, neighbours and friends;
- sensitize students to the problem of VAD;
- help in the early identification of VAD;
- assist in motivational efforts and follow-up of children for prevention and treatment;
- evaluate the knowledge and practices among the families of students on a periodic basis.
- motivate older children to take care not only of their younger siblings, but also of their mother.

Teaching Aids / Methods

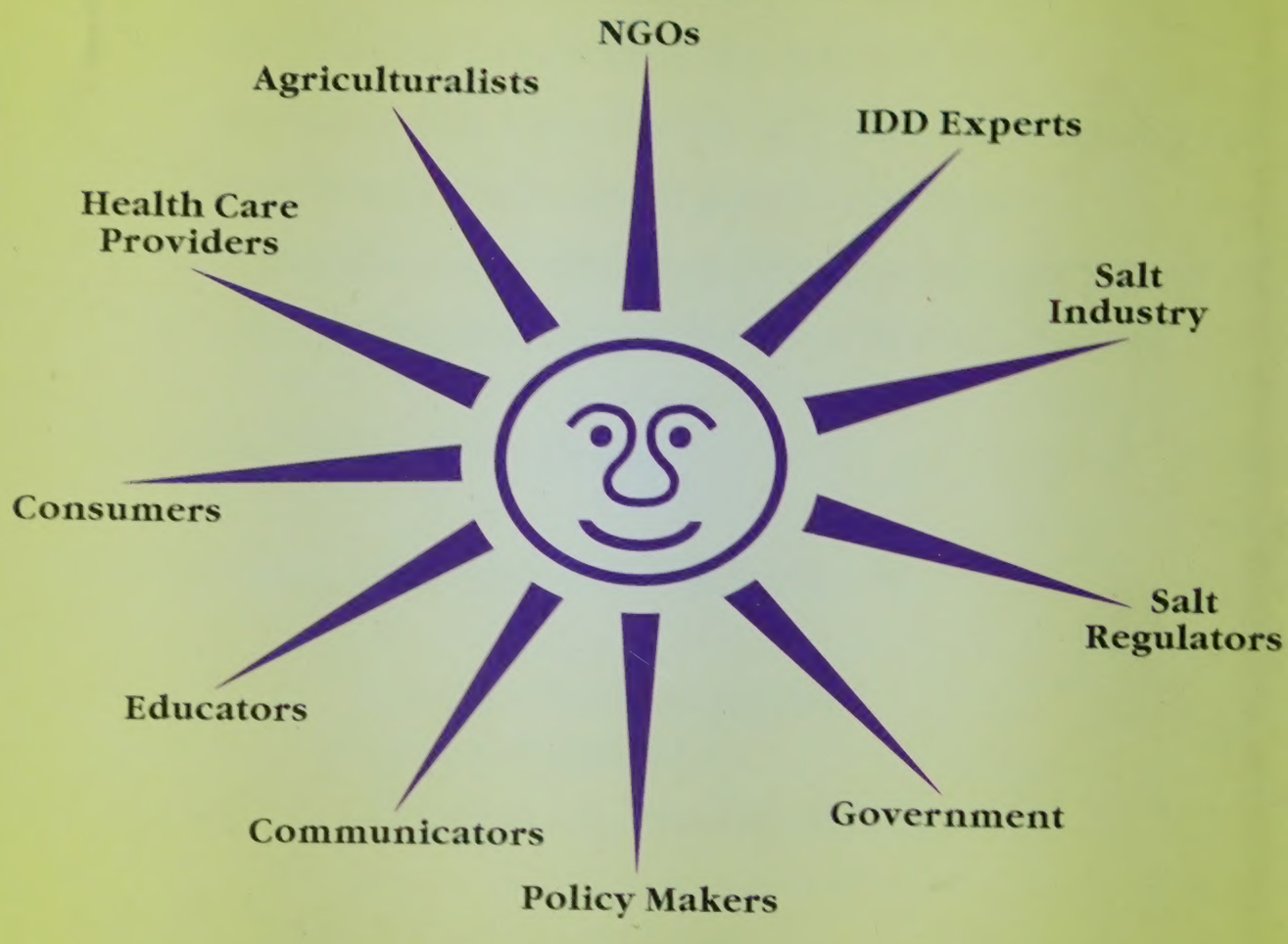
The teaching methods should include :

* Lecture-demonstration
* Group discussion
* Show slides of some deficiencies

The teaching aids should include :

* OHP transparencies
* Slides of a few cases also
* Separate programme duration 2-3 hours, 1½ days workshop.

Vitamin A solution and capsules may also be shown.



Sustaining Elimination of IDD

ICCIDD

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